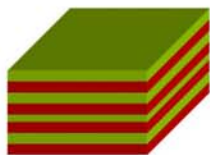


Antiferromagnetic Multilayers and Superlattices

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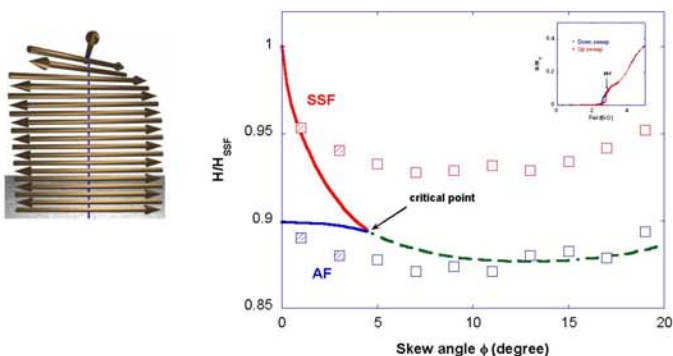
Motivation



- A major challenge in nanomagnetism is to obtain an understanding of antiferromagnets (AF) that is as comprehensive as that of ferromagnets,
- The magnetic structure and switching characteristics of antiferromagnets have become seminal to our understanding of new spintronic concepts and devices,
- To discover rich phenomena due to geometric confinement and proximity effects.

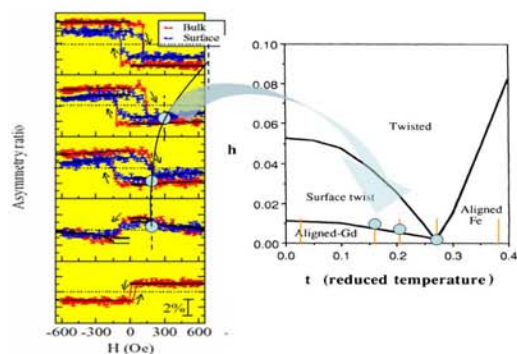
Major Accomplishments

Surface spin flop transition in Fe/Cr



- Trace evolution of magnetic structure with polarized neutron reflectivity
- Determine phase diagram of SSF transition

Phase diagram of ferrimagnetic Fe/Gd



- Characterize low-field nucleation and evolution of the surface-twisted state
- Quantify enhanced Gd ferromagnetic order due to interface exchange. (Y. Choi, *et al.*, PRB **70**, 134420 (2004))

Future Directions

Boundary effects on Cr SDW ordering

- Commensurability of boundary layer
- Interfacial roughness
- Spin frustration

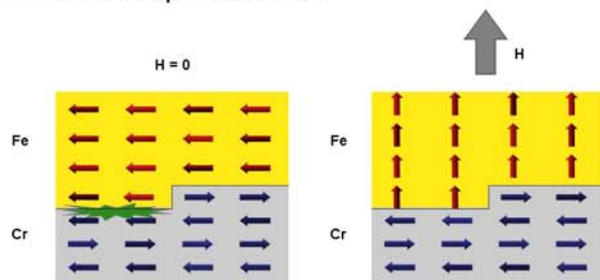
Quantum Critical Phenomena

Cr as a model system

- Relation between electronic structure & SDW-AF ordering
- Tuning the spin density wave
- Quantitative description of critical exponents

Implementation

- Epitaxial Cr-based layered structures
- Tune interfacial spin frustration



C. L'abbé, J. Meersschant, W. Sturhahn, J. S. Jiang, T. S. Toellner, E. E. Alp, S. D. Bader, *Phys. Rev. Lett.* **93**, 037201 (2004)